

CHAPTER 26

MAN-MADE VITREOUS FIBERS

2601. Discussion

a. This chapter provides guidance for controlling and minimizing the exposure of Navy personnel to man-made vitreous fibers (MMVF) during use, removal and disposal of materials.

b. Man-made vitreous fibers, also referred to as man-made mineral fibers (MMMF) or synthetic vitreous fibers (SVF), are a group of fibrous inorganic materials, generally aluminum or calcium silicates, that are derived from rock, clay, slag and glass. The Navy uses MMVF for thermal and acoustical insulation and as reinforcement materials. The MMVF products have replaced asbestos as the primary source of insulation and lagging material.

c. There are three categories of MMVF:

(1) Glass fibers, including glass wool, filamentous glass and special application superfine glass

(2) Mineral wools, more correctly separated into rock wool and slag wool

(3) Refractory ceramic fibers (RCF).

For a complete discussion of MMVF, refer to reference 26-1.

d. In contrast to asbestos fibers, MMVF are amorphous; that is, they are glassy and lack a crystalline matrix. Consequently, the man-made fibers do not split longitudinally into thinner fibers, but break transversely into shorter fibers.

2602. Applicability

The provisions in this chapter apply to all facilities using man-made vitreous fiber products.

2603. Exposure Limits

a. The exposure limits for MMVFs are listed in appendix 26-A.

(1) These exposure limits are based on "pure" product exposures. If the manufacturer's material safety data sheet (MSDS) lists other regulated chemicals (i.e., in the lubricating oils or sizings), then activities must consider the applicable exposure limits for these chemicals.

(2) If the MSDS lists more stringent exposure values, consult the cognizant industrial hygienist or the Navy Environmental Health Center to assess the suggested exposure limit based on its scientific validity.

b. For a literature review of occupational exposures to MMVF, see reference 26-1.

2604. Control of MMVF in the Workplace

a. General Workplace Control Practices. When performing work on MMVF, activities shall:

- (1) Use wet methods whenever possible.
- (2) Provide containments during removal procedures, including glove bags where applicable, if necessary to keep exposures below the exposure limits.
- (3) Minimize airborne dusts and fibers through strict adherence to good housekeeping procedures. At a minimum, activities shall vacuum work areas at the end of the work-shift using a high efficiency particulate air (HEPA) vacuum. Pick up any MMVF scraps that fall to the ground or floor as soon as possible to reduce possible airborne fiber generation as a result of material disturbance.
- (4) Ensure personnel involved in MMVF operations do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the work area.

b. Ventilation

- (1) Certain operations may require the use of local exhaust ventilation (LEV) to ensure that airborne levels of MMVF do not exceed the exposure limits. All such ventilation shall be high efficiency particulate air HEPA-filtered. Activities shall design, construct, install and maintain LEV and dust collection systems per references 26-2, 26-3 and 26-4.
- (2) Work centers using power tools for machining MMVF products (i.e., saws, drills and grinders) shall equip them with HEPA-filtered local exhaust to collect dust at the source.

c. Personal Protective Clothing and Related Facilities

- (1) All personnel working with MMVF materials shall wear goggles or safety glasses with side shields and long sleeved clothing and should wear leather or other impenetrable gloves and disposable (i.e., Tyvek[®] or equivalent) coveralls. If personnel use non-disposable coveralls, they shall thoroughly clean them with a HEPA-filtered vacuum before leaving the work area. Activities shall launder them (separately from other clothing) before being worn again.
- (2) In addition to the personal protective equipment (PPE) listed above, personnel experiencing skin irritation shall wash or shower to remove the irritant substances, and upon return to work shall ensure that their long sleeved clothing is closed at the neck and wrists. They should also wear a head covering.
- (3) Personnel shall use respiratory protection when the exposure limit is or is reasonably expected to be exceeded. The minimum respiratory protection shall be half-mask with P100 filter. Activities shall ensure that respiratory protection complies with the requirements of chapter 15 of this instruction.

(4) Personnel handling MMVF materials shall wash thoroughly with soap and water before breaks and at the end of the work shift. Personnel should shower at the end of the work shift.

(5) Where the potential for exposure is effectively eliminated through the use of glove bags, the use of the PPE described above is not required.

2605. Disposal Procedures

Personnel shall adequately wet MMVF waste before placing it in heavy duty plastic bags or other suitable impermeable containers for disposal in an approved sanitary landfill.

2606. Training

a. Navy personnel who work with or handle MMVF, or who may be occupationally exposed to MMVF, shall receive the following training prior to initial assignment:

(1) The health effects/hazards of MMVF

(2) Uses of MMVF products that could result in exposure

(3) Engineering controls and work practices

(4) Purpose, proper use and limitations of personal protective equipment and the required protective equipment when working with MMVF.

b. Training records shall be per chapter 6.

2607. Industrial Hygiene Surveillance

a. The cognizant Bureau of Medicine and Surgery industrial hygienist shall establish exposure monitoring plans to characterize exposures for employees occupationally exposed to MMVF above the exposure limit. Within a class or category of similar operations, they shall sample at such frequency and pattern as to accurately and reproducibly represent airborne levels produced by a typical operation within the class or category.

b. If the initial sampling or the periodic monitoring results statistically indicate that personnel exposures are below the exposure limit, routine monitoring of personnel may be discontinued.

c. Whenever changes in production, engineering controls, or work practices occur that may effect personnel exposure, exposure monitoring shall be conducted to ensure that personnel exposures are below the exposure limit.

2608. Man-made Vitreous Fiber Medical Surveillance Program

Activities shall conduct medical surveillance, based on industrial hygiene assessment per reference 26-5.

Chapter 26

References

- 26-1. Navy Environmental Health Center Technical Manual 6290.91-1 Rev A of Oct 97, Man-made Vitreous Fibers (NOTAL)
- 26-2. American Conference of Governmental Industrial Hygienists Pub. No. 2092, Industrial Ventilation: A Manual of Recommended Practice, 23rd Edition (NOTAL)
- 26-3. American National Standards Institute (ANSI) Z9.2-2001, American National Standard for Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems (NOTAL)
- 26-4. MIL-HDBK-1003/17C of 29 Feb 96, Industrial Ventilation Systems (NOTAL)
- 26-5. Navy Environmental Health Center Technical Manual, Medical Surveillance Procedures Manual and Medical Matrix, Latest Edition (NOTAL)

Appendix 26-A

Exposure limits for MMVFs

The exposure limits for MMVFs are derived in part from the ACGIH 1998 TLVs:

1. Continuous filament glass fibers	1 f/cc	(a)
2. Continuous filament glass fibers	5mg/m ³	(b)
3. Glass wool fibers	1 f/cc	(a)
4. Rock wool fibers	1 f/cc	(a)
5. Slag wool fibers	1 f/cc	(a)
6. Special purpose glass fibers	1 f/cc	(a)
7. Refractory ceramic fibers	1 f/cc	(a)
8. Refractory ceramic fibers (high temperature)	.05 mg/m ³	(c)

- (a) Fibers longer than 5 µm; diameter less than 3 µm; aspect ratio greater than 5:1 as determined by the membrane filter method at 400-450X magnification (4-mm objective) phase contrast illumination.
- (b) Inhalable fraction. The concentration of inhalable particulate for the application of this exposure limit is to be determined from the fraction passing a size-selector with the characteristics of SI (d)=50% x (1 + e^{-0.06d}) for 0< d ≤100µm where: SI (d) = the collection efficiency for particles with aerodynamic diameter d in µm.
- (c) High temperature means- use temperature of > 850 °C. Operations involving the removal of "high temperature" refractory ceramic fiber (RCF) materials shall adhere to an exposure limit of 0.05 mg/m³ respirable crystalline silica dust. The reason for this variation is that, at high temperatures, RCF will convert to cristobalite, a form of crystalline silica dust. The concentration of respirable particulate for the application of this exposure limit is to be determined from the fraction passing a size-selector with the characteristics of SR(d)= SI(d) [1-F(x)] with Γ=4.25 µm and Σ=1.5 and where F(x)= the cumulative probability function of a standardized normal variable,x. The variable x can be found by using the following formula:

$$x = \frac{\ln (d/\Gamma)}{\ln (\Sigma)}$$